

Parasitic gamasid mites (Acari: Mesostigmata) associated with bats (Chiroptera: Vespertilionidae) on Kunashiri Island, with a description of a new species *Spinturnix uchikawai* sp. nov.

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Abstract — The article presents new data on gamasid mites associated with bat (Chiroptera: Vespertilionidae) on Kunashiri Island. Three species (*Macronyssus charusnurensis*, *M. granulatus*, *M. hosonoi*) are described for this area for the first time. A description of a new species *Spinturnix uchikawai* sp. nov., illustrations, and key to species of the genus *Spinturnix* for the boreal zone of Eastern Palearctic region are given.

Key words — Kunashiri Island, bat ectoparasites, *Spinturnix*

Introduction

The ectoparasite fauna of Eastern Palearctic bats (Chiroptera: Vespertilionidae) (including Japan and the Kuril Islands) is of great interest for researchers of bats and ectoparasites (Kondo et al. 2013). Some species of bats need to be clarified since it was proved that the territory of the Eastern Palearctic is inhabited by several cryptic species of bats (Benda & Tsytulina 2000, Tsytulina & Strelkov 2001, Matveev et al. 2005, Spitzenberger et al. 2006, Kruskop et al. 2012). Data on the bat ectoparasites of the Kuril Islands are fragmentary (Medvedev et al. 1991, Takeyama et al. 2013) and the taxonomic status of some parasites have also changed to date.

In addition, the status of the species *Spinturnix myoti* group in Eastern Palearctic and their relationship with the hosts of genus *Myotis* (eastern water bat *Myotis petax* Hollister 1912, Japanese large-footed bat *Myotis macrodactylus* (Temminck 1840), Ussuri whiskered bat *Myotis gracilis* Ognev 1927 etc.) remain poorly studied. According to current knowledge, the *Spinturnix myoti* group includes six species: *Spinturnix andegavina* (Kolenati 1857), *S. bechsteinii* Deunff, Walter, Bellido & Volleth 2004, *S. dasyncnemi* Kolenati 1856, *S. emarginata* (Kolenati 1856), *S. myoti* (Kolenati 1856) and *S. mystacina* (Kolenati 1857). Most of them inhabit the subboreal Europe (Haitlinger 1978, Giorgi et al. 2004, Lučan 2006, Kristofik et al. 2012, Pocora et al. 2013). For the boreal Palearctic, only the habitation of *S. myoti* has previously been confirmed (Medvedev et al. 1991, Stanyukovich 1997, Orlova 2011, Orlova et al. 2014).

Materials and methods

Bats were caught using stationary nets on Kunashiri Island (Kuril Islands) in two localities: the cave near Pervushin's bay and the bridge on Sulfuric river in July–August 2014 (Fig. 1). From the total 49 bat individuals of two species (36 *Myotis petax* and 13 *M. macrodactylus*), 265 gamasid mites of five species were removed. The collected ectoparasites were stored in 70% ethanol. Mite specimens were mounted in Liquido de Swan medium and identified according to Stanyukovich (1997), Rudnick (1960) and Uchikawa & Wada (1979). Drawings were made by the first author using a Reichert drawing tube.

The mean intensity was calculated as a mean number of the ectoparasites of a given species per one host individual (bats free of parasites excluded). The occurrence was expressed as percentage of individuals parasitized (Beklemishev 1970).

Measurements (in μm) were taken from the holotype female and allotype male, and measurements of paratypes were presented in parentheses in the descriptions below.

All specimens are deposited in the collection Zoological Museum of National Research Tomsk State University (No GM/S21-GM/S22) (Russia).

Taxonomy

The collected gamasid mites belong to the families Spinturnicidae and Macronyssidae. Description of a new species and annotated list of the other four species are shown below.

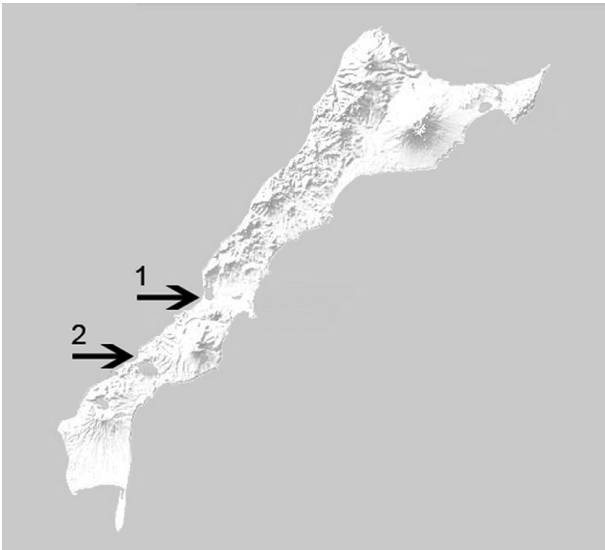


Fig. 1. Map of Kunashiri island, showing the collecting localities: 1, cave near the Pervushin's bay; 2, the bridge on the Sulfuric river.

1. *Spinturnix uchikawai* sp. nov.
(Figs. 2–6)

Female. Idiosoma ovoid 1208 (1160–1422) long, 950 (930–1175) wide.

Dorsum (Fig. 3A). Dorsal shield ovoid 768 (755–790) long, 588 (581–591) wide. Shield surface pitted, with 11 pairs of pores. The soft integument around shield with wide scale sculpturing. Four pairs of podosomal setae 81–139 long. On the dorsal surface of hysterosoma 86 (81–104) setae present, 57–102 long, and posterior marginal setae longest. The peritremes located dorsally at the level of legs III, and extending anteriorly and ventrally between coxae II and III.

Ventrum (Fig. 3B). Tritosternum irregular quadrangle. Sternal shield relatively large, pyriform, with clear reticulate pattern, 205 (210–238) long and 194 (202–221) wide; anterior end pointed, posterior region wide and rounded; three pairs of setae bordering the shield. Genital shield small, weak, mushroom-shaped with one pair of genital seta. Three pairs of oblong sclerites present on ventral surface (between coxa I and II, coxa II and III, on both sides of genital shield). On ventral opisthosoma 47 (42–57) short setae present 35 (31–42) long. Anal shield small, 42 (38–43) long, 81 (77–89) wide. Adanal and postanal setae 14 (12–15) long and 30 (28–31) long, respectively.

Gnathosoma. Total length without palps, 199 (162–209). Hypostomal setae 17 (16–21) long.

Chaetotaxy of legs is normal for the genus. Distal part on dorsal side of tarsi II–V with lanceolate setae.

Male. Idiosoma 896 (861–921) long, 698 (662–720) wide.

Dorsum (Fig. 4A). Dorsal shield ovoid 620 (619–656)



Fig. 2. Gamasid mites *Spinturnix uchikawai* sp. nov. on the wing membrane of Japanese large-footed bat *Myotis macrodactylus*.

long, 499 (497–512) wide. Shield surface dotted and pitted, with nine pairs of pore (two of them with microchaetae). The soft integument around shield with denticle sculpturing. Four pairs of podosomal setae 104 (99–106) long. On the dorsal surface of hysterosoma 44 (43–51) setae present, and 59 (56–60) long. The peritremes located dorsally at the level of coxae III and ventrally continuing forward between legs II and III.

Ventrum (Fig. 4B). Tritosternum flattened. Sterno-genital shield with clear reticulate pattern; 381 (374–389) long and 260 (252–272) wide; posterior margin with distinct projection of the various form (Fig. 5B). Three pairs of oblong sclerites present around sternal shield: between coxa I and II, coxa II and III, near posterior margin of sternal shield. On ventral opisthosoma 17 (15–19) short setae present, and 25 (21–26) long. Anal shield ovoid 148 (136–155) long, 107 (99–112) wide. Adanal and postanal setae 20 (20–21) and 34 (32–35) long respectively.

Gnathosoma. Total length without palps, 172 (165–187). Hypostomal setae XX (35–37) long.

Chaetotaxy of legs is normal for the genus.

Protonymphs and deutonymphs were not found.

Type material. Holotype ♀ (No. GM/S21): Kunashiri Island (Pervushin bay, cave) (44°03'N, 145°04'E), ex *Myotis macrodactylus*, 26.VII.2014, leg. A. V. Zhigalin, D. I. Zhigalina. Allotype ♂ (No. GM/S22): data same as for holotype. Paratypes 5♀♀ and 4♂♂: data same as for holotype.

Site of infection. All specimens were obtained from the membranes of the wings.

Distribution. Detail data of distribution is unknown except for present material. However, distribution of the mites probably coincides with the area of the principal host (*M. macrodactylus*) and covers Japan (Uchikawa & Wada 1979), Kuril Islands, Russian Far East (?).

Etymology. The species is named in honor of Dr.

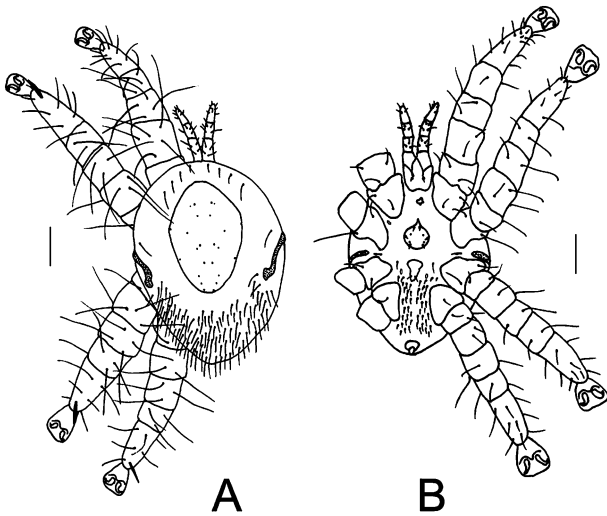


Fig. 3. *Spinturnix uchikawai* sp. nov., female. A, dorsal idiosoma; B, ventral idiosoma. Scales = 300 µm.

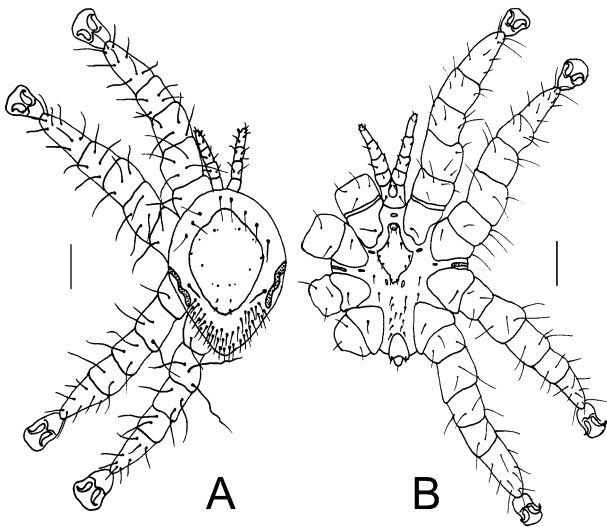


Fig. 4. *Spinturnix uchikawai* sp. nov., male. A, dorsal idiosoma; B, ventral idiosoma. Scales = 300 µm.

Kimito Uchikawa, the Japanese distinguished specialist in bat ectoparasites.

Remarks. According Uchikawa & Wada (1979), presumably Japanese large-footed bat harbours new subspecies of *Spinturnix myoti* (or new species of *Spinturnix myoti* group?), which has some morphological differences from *Spinturnix myoti* sensu Rudnick (1960). In the present study on the basis of our specimens collected in July 2014 on Kunashiri Island, the diagnosis of the present material does not coincide with any of the previously known species, and we described as new species.

Spinturnix uchikawai sp. nov. belongs to the *Spinturnix myoti* species group and is closely allied to *Spinturnix myoti*. The number of ventral and dorsal setae is the systematic basis for many mite groups, especially the Spinturnicidae. The female dorsal shield length of the present species (755–

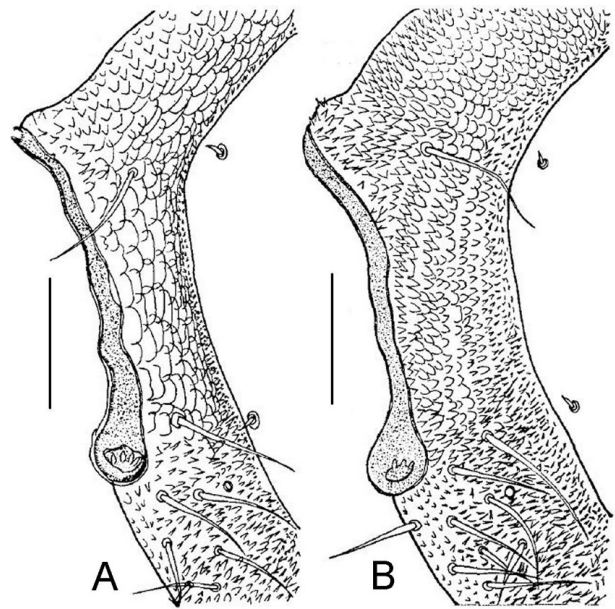


Fig. 5. Integumental striation (from Uchikawa & Wada 1979). A, male of *Spinturnix myoti*; B, male of *Spinturnix uchikawai* sp. nov. Scales = 100 µm.

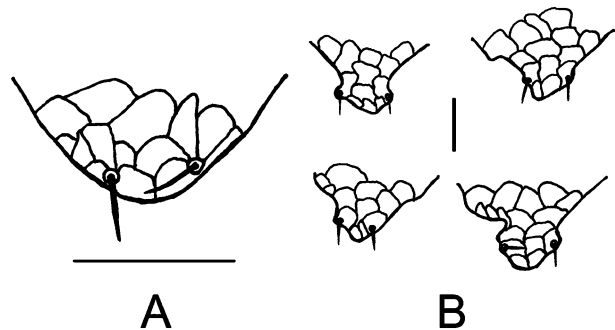


Fig. 6. Posterior margin of sterno-genital shield (males). A, *Spinturnix myoti*; B, *Spinturnix uchikawai* sp. nov. (four variants). Scales = 50 µm.

790) is smaller than that of the specimens of *S. myoti* (800–900). Striation on the dorsal soft integument (Fig. 5) and the form of the sternogenital shield of the male (Fig. 6) were different between *Spinturnix uchikawai* sp. nov. and *S. myoti*. The number of opisthosomal setae on the ventrum was distinctly smaller in male *Spinturnix uchikawai* sp. nov. than in *Spinturnix myoti* (<20 vs. 20<).

2. *Spinturnix myoti* (Kolenati 1856)

Spinturnix myoti is widespread transpalaeartic oligoxenous species, and hosts are species of bat genus *Myotis* (Table 2).

Material examined: 15♂♂, 7♀♀, 12 protonymphs and 16 deutonymphs, Kunashiri Islands (the cave near Pervushin's bay, the bridge on Sulfuric river), ex *Myotis petax*, 26.VII.2014 – 4.VIII.2014, leg. A. V. Zhigalin, D. I. Zhigalina.

Table 1. Infestation rates of ectoparasitic mites on bats captured on Kunashiri Island.

Ectoparasitic mite		Host bat species		Previous records on Kunashiri Island
Family	Species	<i>Myotis petax</i> (n=36)	<i>Myotis macrodactylus</i> (n=13)	
Spinturnicidae	<i>Spinturnix myoti</i> (Kolenati 1856)	50 1.7 83	—	Medvedev et al. 1991
	<i>Spinturnix uchikawai</i> sp. nov.	—	11	
	<i>Macronyssus charusnurensis</i> Dusbabek 1962	150 9.4 44	—	
Macronyssidae	<i>Macronyssus granulosus</i> (Kolenati 1856)	3	50 4.6 85	Uchikawa & Wada 1979
	<i>Macronyssus hosonoi</i> Uchikawa 1979	—	1	
	Total number of mites	203	62	

Notes: The first line — number of ectoparasites; the second — mean intensity; the third — occurrence.

Table 2. Metric data (in µm) of body parts of adult *Spinturnix myoti* ex *Myotis petax* from Kunashiri Island.

Sex (n)	DL	DW	SL	SW
♀♀ (6)	785–871	597–688	217–261	209–221
♂♂ (12)	664–791	502–608	376–406	259–289

Notes: DL – dorsal shield length; DW – dorsal shield width; SL – sternal shield length; and SW – sternal shield width.

3. *Macronyssus charusnurensis* Dusbabek 1962

This species is distributed from Siberian-Far East to the west (the Urals, Western Siberia, Altai, the West Sayan, Tuva, Baikal, Far East, Japan) (Orlova 2014), and monoxenous (eastern water bat) species.

Material examined: 3♂♂, 45♀♀, 102 protonymphs, Kunashiri Island (the bridge on Sulfuric river), ex *M. petax*, 27.VII.2014 – 4.VIII.2014, leg. A. V. Zhigalin, D. I. Zhigalina.

4. *Macronyssus granulosus* (Kolenati 1856)

This species is distributed in transpalearctic subboreal and subtropical regions, and oligoxenous species (parasitic on some species of genus *Myotis*, mainly Lesser mouse-eared bat *Myotis blythii* (Tomes 1857) and *M. macrodactylus*). This is the second mass findings of *M. granulosus* in the boreal zone after the Altai (own data).

Material examined: 6♂♂, 21♀♀, 23 protonymphs, Kunashiri Island (the cave near Pervushin's bay, the bridge on Sulfuric river), ex *M. macrodactylus*, 26.VII.2014 – 1.VIII.2014, leg. A. V. Zhigalin, D. I. Zhigalina; and 1♂ and 2♀♀, ex *M. petax*, 30.VII.2014 – 3.VIII.2014, leg. A. V. Zhigalin, D. I. Zhigalina.

5. *Macronyssus hosonoi* Uchikawa 1979

Macronyssus hosonoi is poorly studied species, belonging to Siberian-Far East faunal complex. The species is probably oligoxenous (species of genus *Myotis*), but findings are very few (the Altai, Tuva, Krasnoyarsk, Primorsky

Krai, Kamchatka, Japan) (Uchikawa & Wada 1979, Medvedev et al. 1991, Stanyukovich 1997, Orlova et al. 2014).

Material examined: 1♂, Kunashiri Island (the cave near Pervushin's bay), ex *M. macrodactylus*, 26.VII.2014, leg. A. V. Zhigalin, D. I. Zhigalina.

Thus, of the five collected species, three species (*Macronyssus charusnurensis*, *M. granulosus*, *M. hosonoi*) were recorded from the study area for the first time. Apparently, in the East Palearctic boreal zone the *Spinturnix myoti* group includes two species: *Spinturnix myoti* and *Spinturnix uchikawai* sp. nov.

Key to species of the genus *Spinturnix* Heyden 1826 in Boreal zone of Eastern Palearctic

Females

1. Dorsal opisthosomal setae less than 8 pairs2
— Dorsal opisthosomal setae more than 203
2. Three to four pairs (2 long and 2 short) present on the end of opisthosoma; lanceolate setae on tarsi II–IV absent; tritosternum disk-shaped*S. kolenatii* Oudemans 1910
— Six to seven pairs dorsal opisthosomal setae present; lanceolate setae present on dorsal tip of tarsi II–IV*S. plecotinus* (Koch 1839)
3. Dorsal opisthosomal setae not more than 504
— Dorsal opisthosomal setae more than 507
4. Tritosternum invisible; leg setae smooth5
— Tritosternum large, mushroom-shaped; some dorsal setae on legs I–II serrated*S. psi* (Kolenati 1856)
5. Dorsal opisthosomal setae less than 406
— Dorsal opisthosomal setae more than 40*S. bregetovae* Stanyukovich 1995
6. Dorsal shield with two large rounded projections at the front and at the back; podosomal setae about 2 times shorter than opisthosomal ones*S. acuminatus* (Koch 1836)
— Dorsal shield with one large rounded projections at the front; at the back shield smoothly narrowing; length of

- podosomal and opistosomal setae nearly equal
*S. barbastelli* (Kolenati 1856)
7. Sternal shield rounded or pear-shaped8
 — Sternal shield pentagonal
*S. maedai* Uchikawa & Wada 1979
8. Dorsal opisthosomal setae 90–130; dorsal shield large
 (more than 800 µm)*S. myoti* (Kolenati 1856)
 — Dorsal opisthosomal setae 80–100; dorsal shield small
 (less than 800 µm)*S. uchikawai* sp. nov.

Males

1. Two setae present on the end of the opisthosoma;
 lanceolate seta present on dorsal tip of tarsi II–IV
*S. plecotinus* (Koch 1839)
 — Four–46 setae present on the end of opisthosoma2
2. Dorsal opisthosoma with 4 setae. Sternogenital shield
 smoothly rounded at the back; surface of the shield orna-
 mented with large reticulate pattern; 8 pairs of setae pre-
 sent on ventral integument between II–IV coxae
*S. kolenatii* Oudemans 1910
 — On dorsal opisthosoma 14–46 setae present3
3. Three pairs setae present on sternogenital shield4
 — Four to five pairs setae present on sternogenital shield 7
4. Sternogenital shield spade-shaped. Dorsal opisthosomal
 surface with 32–34 seta. Tritosternum indiscernible
*S. bregetovae* Stanyukovich 1995
 — Sternogenital shield bottle-shaped5
5. Dorsal opisthosoma with 22–38 setae. Dorsal shield dia-
 mond-shaped with rounded corners
*S. maedai* Uchikawa & Wada 1979
 — Dorsal opisthosoma with less than 21 setae6
6. On dorsal opisthosoma 18–20 setae present
*S. barbastelli* (Kolenati 1856)
 — On dorsal opisthosoma 16–18 setae present
*S. acuminatus* (Koch 1836)
7. On sternogenital shield 4 pairs of setae present8
 — On sternogenital shield 5 pairs of setae present
*S. psi* (Kolenati 1856)
8. Posterior margin of sternogenital shield smooth (Fig.
 6A); on ventral opisthosoma more than 20 setae present.
 Soft integument around shield with scaled sculpturing
*S. myoti* (Kolenati 1856)
 — Posterior margin of sternogenital shield with small ir-
 regular projection (Fig. 6B); on ventral opisthosoma 15–
 19 setae present. Soft integument around shield with
 denticle sculpturing (Fig. 5B)
*Spinturnix uchikawai* sp. nov.

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